Integrated Financial Management (IFM) Program

Program Risk Management Plan

Version 3.0

December 31, 2004

National Aeronautics and Space Administration

NASA Headquarters
Washington, DC

Revision History

Version	Purpose	Page	Date
1. Version 1.0	Original Baseline		Sept 15, 2000
2. Version 1.1	1. Section 1: Enhanced section to reflect knowledge gained during evaluation of best practices and domain knowledge 2. Section 2.2: Replaced the word "Problem" with "Issue" 3. Added Section 4.1 Program Staff Identification of Risks, and Section 4.2 Risk Identification/Analysis Tools and Techniques 4. Section 5.2: Enhanced information regarding risk categories 5. Section 6: Enhanced definitions of risk response rules and options 6. Add reference to the IFM Program Risk Profile in Section 6.5 7. Added Section 6.8 Risk Database 8. Section 7: Revised narrative to indicate that Module Project Managers would periodically report top Project risks and identify Program audit role 9. Section 8: Incorporated latest facilitation process chart and enhanced description of risk management process 10. Changed Monthly Status Review to Program Risk Review 11. Added Section 10 Descope Approach 12. Added Section 11 References 13. Added a list of acronyms 14. Removed the Program risks from this document. They are now maintained as Appendices and updated separately on a recurring basis.	1 2 4 6 10 12 13 14 15 16 17 17 AB-1 Appendices	May 31, 2001
3. Version 2.0	1. Converted IFM Risk Program from 3x3 matrix to the Agency's new 5x5 matrix and converts terminology to reflect NASA Agency terminology.	Section 5	May 22, 2003
4. Version 3.0	1. Added Risk Owner and Risk Manager to the Roles and Responsibilities Table 2. Organized the document according to NASA's Continuous Risk Management Model (CRMM) phases 3. Provided new diagram for the IFM Program's Risk Management Process according to the CRMM phases and roles and responsibilities 4. Added new NASA 5x5 Risk Matrix, and Likelihood and Consequence Criteria 5. Added an Appendix that addresses the Program Risk Contingency Reserve Allocation process		December 31, 2004

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1 INTRODUCTION

1.1 PURPOSE

This plan addresses the Integrated Financial Management (IFM) Program Office risk management strategy. The purpose of the IFM Program Risk Management Plan is to document and communicate the strategy for managing risks for the Program. The Plan documents the roles and responsibilities and standard processes and techniques for identifying, analyzing, planning, tracking, and controlling Program risks. A list of the Program's key risks and mitigation strategies can be found in the Program's Erasmus database.

The Program Risk Management Plan was developed consistent with the *IFM Program Risk Management Framework* – Version 2, *National Aeronautics and Space Administration (NASA) Procedures and Guidelines (NPG) 8000.4 – Risk Management Procedures and Guidelines* and *NPG 7120.5B – NASA Program and Project Management Processes and Requirements*. This plan will be periodically updated and kept current with the evolution of the IFM Program and the associated Projects.

1.2 ORGANIZATIONAL COMPONENTS MANAGING PROGRAM LEVEL RISKS

IFM Program Management is comprised of three components:

- Managerial – IFM Program Office
- System/Module Implementation – Module Projects and eGov
- System/Module Integration – IPO.

The IFM Program is managed centrally by the IFM Program Office, located at NASA Headquarters. Responsibilities of this office include setting scope, establishing module sequencing and timing, allocating funding to projects, managing internal and external stakeholders, and providing a program-centric change management framework.

The Module Projects and eGov Initiatives provide management of the functional module implementation for IFM (e.g., Integrated Asset Manager [IAM]) and eGov (e.g., eTravel) systems. These management responsibilities are fundamental to the success that the Program will have in implementing each functional IFM and eGov module.

The IPO provides Program-level management of the functional module integration. IPO responsibilities are fundamental to the success that the Program will have in integrating the functional modules into a cohesive system.

The three Program management organizations share responsibility for managing Program risks. The risks identified and managed by each are aligned with each organization's responsibilities. The driving areas of concern for the IFM Program Office, Module Projects and eGov, and IPO, respectively, include:

IFM Program Office

- Building a coalition of support for a program through internal and external stakeholder relationship management
- Orchestrating a controlled modular implementation
- Maximizing the benefits realized by the Agency to ensure investments made to implement the Program objectives are deemed well spent.
- Communicating a Agency change management strategy to assist the Project's ability to re-engineer business processes, promote the Agency's Commercial Off-The-Shelf (COTS) solution, and provide value to customers and stakeholders

Module Projects and eGov

- Building a coalition of support for the Module Projects through internal and external stakeholder relationship management, including implementation contractor
- Managing a controlled modular implementation
- Working with Centers to resolve Module implementation issues
- Ensuring that products meet Agency requirements prior to 'Go-Live"

IPO

- Achieving an integrated solution; avoiding stovepipe systems
- Overcoming technical difficulties of COTS implementation and integration
- Resolving ownership and conflict issues with respect to data and processes shared by multiple modules
- Maintaining and enforcing standards within and across the different functional organizations and Centers
- Operating within the current and projected NASA Information Technology (IT) architecture

Program level risk management is the composite of activities undertaken by the IFM Program Office, the Module Projects, eGov, and the IPO. This plan addresses the IFM Program Office risk management strategy only. Each Module Project, eGov Initiative, and IPO maintains separate Project Risk Management Plans.

1.3 ISSUES VS. RISKS

An important factor in effectively identifying risks is understanding the difference between issues and risks. Risks are events that have yet to occur, but represent some level of impact to the Program. Issues are risks that have been realized and require prompt and direct action. Risk management is intended to avoid future issues. To be successful, the IFM Program needs to be concerned about both risks and issues.

Issues are characterized by the following attributes:

- Specific in nature
- 100 percent certainty of occurrence, i.e., the issue in question is relevant today
- Defined solution often employed to solve the issue or reduce impact
- Potential for negative impact to Program, Module Projects, eGov initiatives, or IPO.

A separate Issue Management Plan Framework address the Program's strategy for managing issues[1].

Issue Example: The hardware vendor did not deliver the required equipment on time and it will not be available for 2 months, which will cause a schedule slip. *(The event has already occurred and has a negative impact on schedule.)*

Contrarily, risks are characterized by the following attributes:

- Broad based in nature
- Usually addresses a long term consequence, i.e., the risk in question is mentioned in future tense
- Uncertainty of occurrence
- Mitigation strategies often employed to reduce likelihood of occurrence and/or consequence
- Potential for negative impact to Program, Module Projects, eGov initiatives, or IPO.

Risk Example: Because the vendor stated that there is a 50% chance that the hardware will not be available by the due date, the schedule may slip. *(The event has not happened and may have a negative impact on the project.)*

Subsequent sections provide more detailed information about the primary stages of the Program's continuous risk management process—identification, analysis, planning, tracking, controlling, and communicating.

1 *Issue Management Plan Framework*, November 19, 2001

2 ROLES AND RESPONSIBILITIES

Program risk management is a responsibility shared by the IFM Program Office, Module Projects, eGov initiatives, and IPO. Specific roles and responsibilities are listed in Table 2.1.

Table 2.1 – IFM Program Risk Management Roles and Responsibilities

Roles	Responsibilities
IFM Program Director (IFM Deputy Program serves as back-up)	• Appoint Program Risk Manager to actively manage Program risks • Identify top Program risks (nominally 5 – 10) for management and external status reporting • Review and validate Program risks identified by Program Staff, external reviews, and assessments • Delegate responsibility for individual risks to members of the Program Staff or Project Managers as appropriate • Approve mitigation strategies and contingency plans for Program risks • Approve invocation of risk contingency plans • Periodically monitor Program risk status, contingency plans, and mitigation efforts • Conduct Quarterly Risk Reviews (QRR) with each active Module Project, eGov Module, and IPO • Periodically report risk status, trend analysis, and success of mitigation efforts of Program's top risks and selected Project-level risks to the Program Management Council and external entities.
Program Staff	• Identify new risks (using risk identification techniques) • Report new risks to Risk Manager, Project Lead, etc., as they are identified.
Risk Manager	• Work with the Program Director/Project Manager to review and validate Program/Project risks identified by Program/Project Staff, external reviews, and assessments • Assist Risk Owners in developing risk statements, performing risk assessment and mitigation strategies, as required • Track all Program/Project risks in a Risk Database • Work with Risk Owner to assess, monitor, and control Program/Project risks, as required • Facilitate periodic Program/Project risk reporting and status updates • Facilitate QRRs and review Project QRR briefings (Program Risk Manager) • Prepare Project QRRs (Project Risk Manager) • Report Program/Project risks via the Erasmus tool and MSR monthly

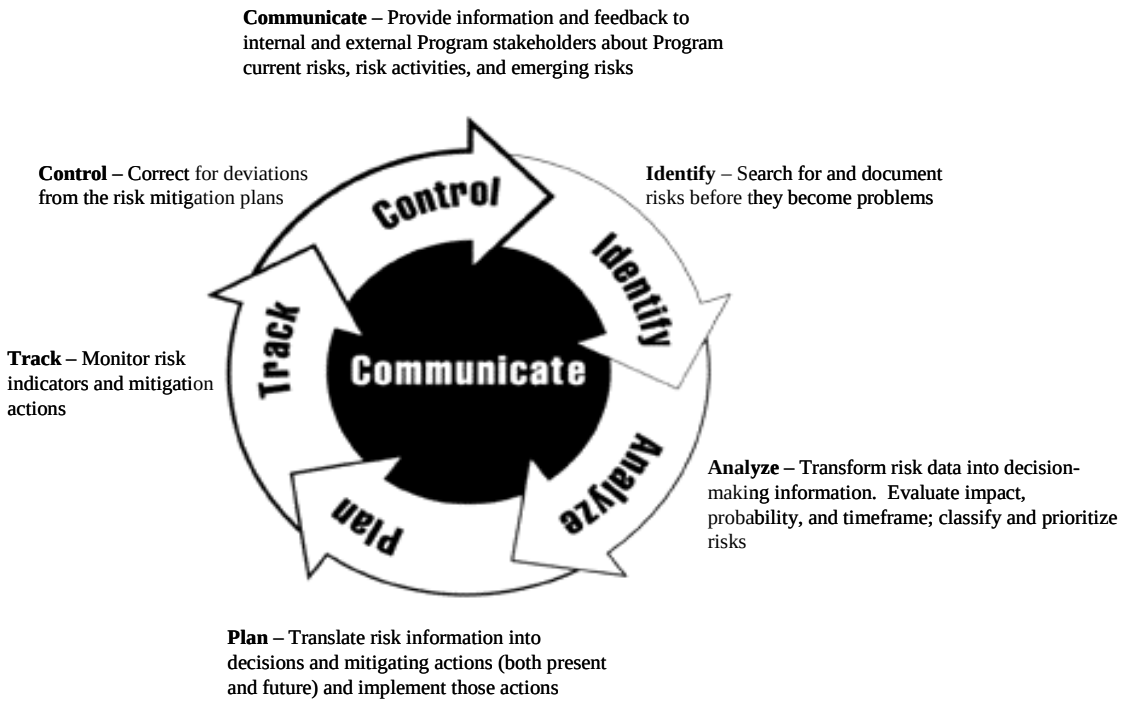
Roles	Responsibilities
	• Review the Program/Project Risk Management Plan annually and update as required.
Risk Owner	• Perform risk assessment (e.g., writing risk statement and assigning likelihood, consequence, criticality ratings, and timeframes) • Develop and implement handling options and mitigation strategies for assigned risks • Periodically report risk status, trend analysis, and success of mitigation efforts in reducing the likelihood and/or consequence of assigned risks • Document lessons learned and potential best practices.
IPO, Module, and eGov Project Managers	• Develop IPO, Module, and eGov Project Risk Management Plans consistent with IFM Program Risk Management Framework • Delegate responsibility for individual risks to members of the IPO, Module, and eGov Project staff, or elevate to the Program Office level as appropriate • Identify top IPO, Module Project, and eGov Project risks (nominally 5) for management and external status reporting • Approve mitigation strategies for top Project risks • Provide monthly risk status, trend analysis, and success of mitigation efforts of IPO, Module Project, and eGov Project top risks via MSR briefings • Perform reassessment of existing risks quarterly and report during QRRs • Approve Centers' IFM Risk Management Plans.
Receiving Center Lead	• Manage Module Center implementation and change management risks for NASA Center • Develop NASA Center's Risk Management Plan (shall be incorporated into Center Implementation Plan) • Review and validate implementation and change management risks identified by Center Implementation Team members, periodic external reviews, and assessments • Delegate responsibility for individual deployment and change management risks to members of the Center Implementation Team • Identify top Center implementation and change management risks for management and external status reporting, and provide to the Program Risk Manager • Approve risk mitigation strategies for top Center risks • Continuously monitor NASA Center risk status, trend analysis, success of risk mitigation efforts, and contingency plans • Provide monthly report status, trend analysis, and success of mitigation efforts and contingency plans of NASA Center's top risks to Program Risk Manager (via MSR briefing) and external

Roles	Responsibilities
	entities.
External Reviewers (e.g., PMC)	• Periodically review risk status, trends, and success of mitigation strategies, and contingency plans for top Program, IPO, Module, and eGov Project risks • Identify new Program risks • Recommend risk handling options, mitigation strategies, and contingency plans for identified risks to the Program Manager.

3 OVERVIEW OF IFM PROGRAM RISK MANAGEMENT

Risk Management is an important aspect of Program and Project management, but it is tangential to the primary focus of each. To facilitate active risk management, the Program has developed a Risk Management Process based on the Agency's Continuous Risk Management Model (CRMM), outlined in *NPG 8100.4, Risk Management Procedures and Guidelines* and *NPG 7120.5B, NASA Program and Project Management Processes and Requirements*.

Figure 3-1. NASA's Continuous Risk Management Model



4 RISK IDENTIFICATION

Successful risk identification is dependent upon open communication and awareness of what constitutes a risk. During the formulation stage of the IFM Program, a review of lessons learned, industry surveys of best practices, and experiences gained from the previous NASA financial management system program was performed to identify potential risks to Program success. Using the lessons learned and industry information as drivers, the Program defined a set of key risks facing the Program and a corresponding set of First Principles for successful COTS implementation management. The First Principles, which represent risk mitigation strategies for avoiding the issues that negatively impacted the earlier NASA financial management program, became the basis for IFM Program reformulation. (The First Principles can be found in Appendix A.)

4.1 PROGRAM STAFF IDENTIFICATION OF RISKS

Each Program staff member will continuously project forward the logical outcomes of current strategies, plans, and activities, exercising their expert opinion and judgment to identify new risks. When reporting a risk, it is important to include contextual information that indicates how or why the risk may negatively the Program so that the Risk Manager and Program Director have sufficient information to determine whether the potential risk requires further investigation.

To enable the Program to maintain insight into top Program-level risks, each Project and Center will provide risk status data monthly as a part of Project briefings presented at the MSRs in accordance with the MSR template. Review of this information will enable the Program to identify risks across various Projects, identify potential Program-level risks, and suggest coordination or best practices for mitigation strategies.

It is important for staff members to report any suspected risk to the Risk Manager or Program Director in a timely fashion. Scheduled meetings are not the only forums to report potential risks. This is particularly important because some risks may be realized in the near-term. (See Section 5.5.)

4.2 RISK IDENTIFICATION/ANALYSIS TOOLS AND TECHNIQUES

As stated in the previous section, under Roles and Responsibilities, each member of the Program staff is encouraged to identify and report potential risks. Each staff member will use identification techniques along with their expert opinion and judgment to identify new risks. Common identification techniques include the Top-Down Approach and Bottoms-Up Approach:

- Top-Down approach – Involves the identification of significant management (e.g., governance structure, contractor groups), functional (e.g., re-engineered processes, COTS software capabilities, requirements), and operational (e.g., COTS software implementation and performance, computer systems, network) components followed by a qualitative analysis of the potential points of failure and their root causes. Review of lessons learned from similar projects is a typical, or traditional, top down analytical technique. FTA is an example of a rigorous top down technique.

- Bottoms-Up approach – Involves the expression of the project as a detailed set of events or activities followed by the identification and mitigation of potential causes of failure. Failure Mode, Cause, and Effect Analysis (FMCEA) is an example of a rigorous bottoms-up technique.

Given the characteristics of the IFM Program, it has been determined that the FTA approach is the most appropriate top-down technique for identifying Program risks. Such identification analysis outputs can provide needed information for the Risk Manager and Program Director to determine whether the Program should track the risk.

To enable the Program to maintain insight into top Program-level risks, each Project will provide risk status data monthly as a part of Project briefings presented at the MSRs in accordance with the MSR template. Additionally, Projects should be sure to include change management risks (often aligned with mission success). The IPO, Module, and eGov Project Managers are responsible for evaluating Project-level risks to determine whether they may potentially impact other parts of the IFM Program or the Program overall.

It is important for staff members to report any suspected risk to the Risk Manager or Program Director in a timely fashion. Scheduled meetings are not the only forums to report potential risks. Constant communication is stressed so that risks can be assessed and evaluated immediately. This is particularly important because some risks may be realized in the near-term. (See Section 5.5.) Additionally, staff members should not exclude risks because their preliminary assessment indicates that the risk is unlikely to occur. All risks should be reported so that they can be thoroughly assessed and appropriate handling options and mitigations assigned.

5 RISK ANALYSIS

There are several steps that must be completed to achieve effective risk analysis.

1. A concise risk statement must be written.
2. Identified Program risks must be assessed to determine the ***likelihood*** of occurrence, ***consequences*** to the Program if the risk does occur, and the overall ***criticality*** level for each risk.
3. A time frame for risk realization must be established.

Completion of these steps results in a comprehensive risk profile that enables subsequent planning, tracking, and management. The Program Director will review risk assessments and provide concurrence.

5.1 WRITING A RISK STATEMENT

NASA Risk Management training materials developed by the Software Assurance Technology Center (SATC) at NASA GSFC states that risk statements should be clear and concise, but with adequate level of information that can be understood. Specifically, it suggests that risks be written using a 'condition-consequence' format, wherein a risk reads as follows:

*"Given the <**condition**>, there is a possibility that <**consequence**> will occur."*

5.2 ASSESSING RISK LIKELIHOOD

Each risk will be assigned a likelihood of occurrence rating based on the risk likelihood table shown in Table 5-1.

Table 5-1. Likelihood Ratings

Rating	Likelihood of Occurrence	NPG 8000.4 Guidance
5 Very High	Event is in imminent danger of occurring and current process or approach will likely not prevent this event. Risk should be considered for transition to an issue.	Likely to occur
4 High	Event may occur and current process or approach will likely not prevent the event.	Probably will occur
3 Moderate	Event may occur but current process or approach may prevent it from occurring.	May occur
2 Low	Current process or approach is usually sufficient to prevent this type of event. The event probably will not happen.	Unlikely to occur

Rating	Likelihood of Occurrence	NPG 8000.4 Guidance
1 Very Low	Current process or approach is sufficient to prevent this event from occurring.	Improbable

5.3 ASSESSING RISK CONSEQUENCE

Risk consequences are associated with one or more of the four risk categories (which correspond to the Program's performance metrics)—Cost, Schedule, Integration/Technical, and Mission Success. As a part of risk analysis, the Risk Manager and Risk Owner will assign risk consequence ratings based on the following categorize the risk accordingly.

Cost
- Budget
- Staffing

Schedule
- Blueprinting
- Realization
- Go-Live

Integration/Technical
- System module deployment
- Integration complexities
- IT infrastructure
- Performance

Mission Success
- Agency business drivers and Integration Project functional drivers
- Functional requirements
- Gap in system functionality vs. requirements
- Successful reengineered process implementation
- Effective Program change management

The tables that follow are used to assess the consequences of each risk according to the identified risk category. When a risk is associated with multiple risk categories, the risk's consequence in each associated category is assessed and documented (tracked).

Table 5-2a. Consequence Ratings for Cost Risks

If event "X" were to occur, then the cost consequences would be:

Rating	Cost Criteria
5 Very High	• Event will cause Program or Project end of year (EOY) Manager's estimate to exceed current plan by more than 15%; **or** • Total cost increase cannot be supported by existing Program funds; **or**

Rating	Cost Criteria
	• Negative budget event will impact Program funding available for pending modules, causing a delay in initiating new modules and/or eliminating planned modules
4 High	• Event will cause Project Manager's EOY estimate to exceed current plan by more than 10, but less than 15%; **or** • Total cost increase cannot be supported without full use of project reserves plus additional funds from Program reserves
3 Moderate	Event can be covered by full use of available project funding reserves and project manager believes that project can be completed without requesting additional funding
2 Low	Event impact will be limited to task or activity and any cost overruns can be fully covered by partial use of available project reserves not to exceed 30% of remaining reserves.
1 Very Low	Event can be resolved with minor use of project reserves (less than 5% of remaining reserves)

Figure 5-2b. Consequence Ratings for Schedule Risks

If event "X" were to occur, then the schedule consequences would be:

Rating	Schedule Criteria
5 Very High	Project performance related issues or decision-making delays would cause the project end date to be missed with significant impact on Program commitment or loss of executive management commitment. Project commitment date cannot be met through use of schedule reserve.
4 High	Performance related issues or decision-making delays will cause significant impacts to critical path and current project phase completion date cannot be met through use of schedule reserve. Project commitment date is not effected.
3 Moderate	Performance related issues or decision making delays will cause project milestones to be missed, but current project phase and Project end date are not jeopardized and can be achieved through use of schedule reserve
2 Low	Performance related issues or decision making delays will cause delays to individual deliverables or task completion dates, but major milestones, project phases and project end date can be achieved on time
1 Very Low	Performance related issues or decision making delays will not cause schedule delays that cannot be covered without use of any existing schedule reserve

Figure 5-2c. Consequence Ratings for Technical Risks

If event "X" were to occur, then the technical consequences would be:

Rating	Technical Criteria
5 Very High	Program/Project will not meet minimum mission or technical success/exit criteria and no alternatives exist
4 High	• System performance will be unsatisfactory during periods of normal operations; **or** • System solution will be incompatible with NASA's IT standards; **or** • System will be unable to satisfactorily integrate with other systems or IFM modules
3 Moderate	• System will experience unsatisfactory performance degradation during peak load periods; **or** • Software will not support some Agency IT standards
2 Low	• System will experience noticeable, but acceptable performance degradation during peak periods; **or** • Software will not support some IT standards but upgrades are scheduled/expected
1 Very Low	• No system performance degradation will occur during normal operations; **and** • System will support IT standards

Figure 5-2d. Consequence Ratings for Mission Success Risks

If event "X" were to occur, then the mission success consequences would be:

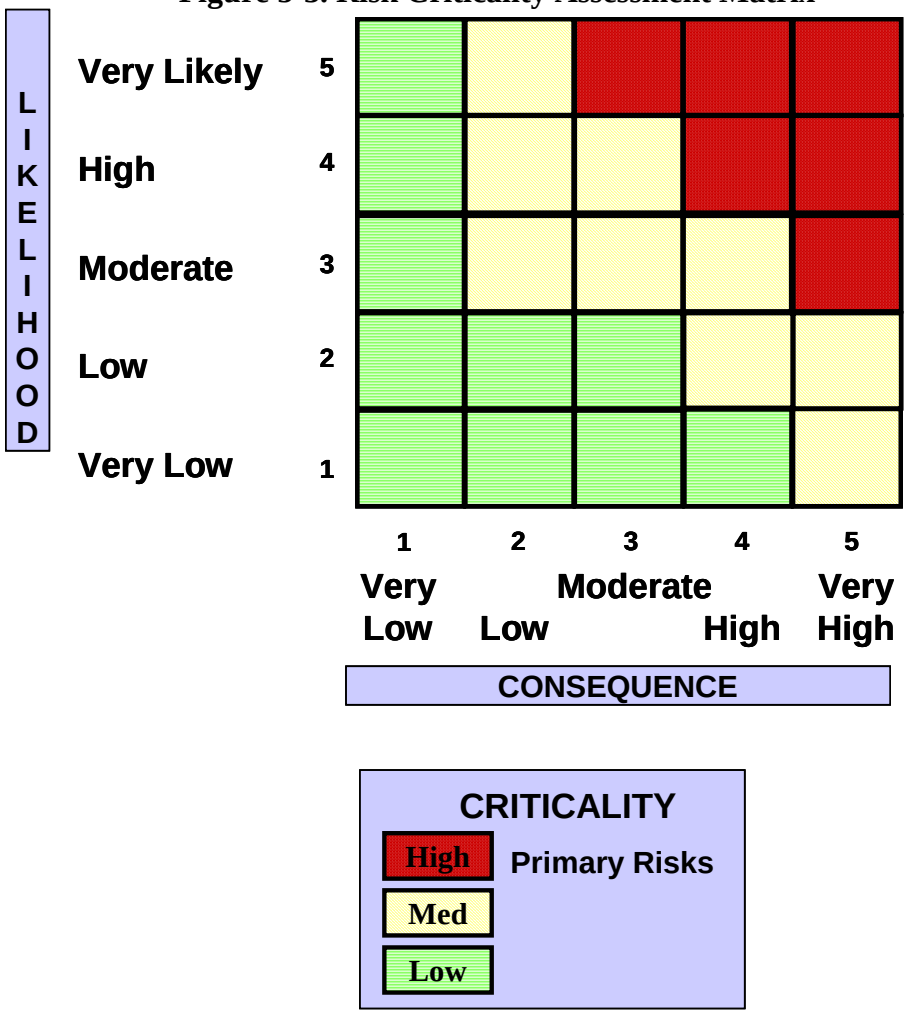
Rating	Mission Success Criteria
5 Very High	• Major functionality will be lost and gaps cannot be closed; **or** • Event will cause project to achieve less than 50% of functional driver benefits realization; **or** • System will be rejected by users and functional community
4 High	• Major functionality will be lost but gaps can be closed by using additional software bolt-ons; **or** • Event will cause project to achieve less than 70% of functional driver benefits realization; **or** • Majority of users will reject the system and significant additional transition support is required to overcome resistance
3 Moderate	• Significant functionality will be lost but gaps can be accommodated by process changes or workarounds; **or** • Minor additional transition support will be required to overcome user resistance; **or** • Benefits realization will be substantially below expectations for one functional driver
2 Low	• Functionality loss will be acceptable and any gaps will be closed

Rating	Mission Success Criteria
	using future enhancements/fixes; **or** • Minor user resistance will be encountered not requiring additional transition support; **or** • All critical functional driver benefits will be met by module
1 Very Low	• Functionality loss will be acceptable and no gap closure is necessary; **and** • Users will accept new system; **and** • All expected benefits will be achieved

5.4 DETERMINING RISK CRITICALITY

Using the Likelihood and Consequence rating guidance, each risk is assigned a likelihood and consequence rating in each of the affected risk categories. Using these ratings, a Risk Criticality Assessment Matrix is generated for each risk. The criticality is determined by plotting the likelihood and consequence ratings and then determining which area the risk falls into. The highest level of consequences among the affected categories is used to calculate risk criticality.

Figure 5-3. Risk Criticality Assessment Matrix



5.5 DETERMINING RISK TIMEFRAMES

There are two timeframes that can be associated with the management of risks. The first timeframe refers to whether the consequence of a risk is likely to occur, the consequence timeframe. The second is the timeframe within which action should be taken to mitigate the risk, the mitigation timeframe. These timeframes are often, but not always, the same. The following definitions represent timeframes to be applied during risk assessment. The mitigation timeframe assigned during analysis may be revised during the planning phase.

- Near-term – Less than 90 days
- Mid-term – 90-180 days
- Long-term – More than 180 days.

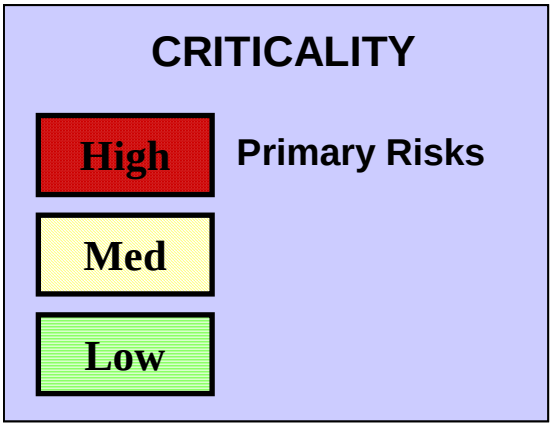
6 RISK PLANNING, TRACKING, AND CONTROL

Planning, tracking, and control of risks represent the heart of active risk management. It is when the Program decides what, if anything, should be done to mitigate risks, what methods are used to measure the effectiveness of mitigation strategies, and what steps should be taken to adjust for changes in risk posture.

6.1 RISK RESPONSE RULES

To effectively plan, track, and control risks, one must understand the Program's Risk Response Rules. The following risk response rules have been established for the associated risk criticality calculations.

Figure 6-1. Risk Criticality Ratings



- All HIGH criticality risks require both a mitigation plan and a contingency plan.
- MEDIUM criticality risks require a contingency plan. Mitigation strategies may be required. The IFM Program Director may recommend that a mitigation plan be written, and may recommend a mitigation approach
- LOW criticality risks typically do not require a mitigation strategy or contingency plan.

Note: Medium risks do not *require* mitigation strategies because the Program may choose to accept the risk. In this instance, the Program decides that it will not expend resources to mitigate the risk and takes a chance that the risk will not be realized. However, all Projects must develop contingency plans to prepare for impacts if the risk becomes an issue.

6.2 RISK HANDLING OPTIONS

The first step in planning, tracking, and control is to assign a risk handling option. The standard IFM Program Risk Response Options are explained in Table 6-1:

Table 6-1. IFM Risk Handling Options

Option	Approach	Possible Criticality Rating
Transfer	Reallocate the risk to others	Medium, Low
Accept	Do not develop mitigation strategies; prepare written rationale and identify contingency strategy if needed	Medium, Low
Watch	Monitor risk attributes; establish metrics	Medium, Low
Mitigate	Eliminate or reduce likelihood of occurrence or consequence; identify contingency plan	High

The risk response rules developed in conjunction with the risk criticality determination are to be followed where applicable. Where a response option is not specifically determined by risk criticality, the Risk Owner will assign a response option. The IFM Program Director approves assigned response options. Mitigation and contingency plans are then developed based on guidance from the Program Director, lessons learned, industry best practices, or other collected data.

6.3 RISK OWNERSHIP

Though mentioned in the Roles and Responsibilities section, it is important to understand the role of the Risk Owner for risk management. The IFM Program Director assigns each approved risk to the appropriate staff member or organizational entity. Each person or organization that is assigned a risk becomes a Risk Owner, responsible for managing the assigned risk. For each assigned risk, the Risk Owner is responsible for the following activities (with assistance from the Risk Manager as needed):

- Developing a mitigation strategy as appropriate
- Developing a contingency plan as appropriate (requires authority of IFM Program Director to execute)
- Obtaining IFM Program Director approval of mitigation strategies and contingency plans
- Implementing approved mitigation strategies
- Establishing effectiveness measures
- Incorporating risk mitigation activities and milestones in the Program schedule
- Recording mitigation actions taken
- Periodically evaluating effectiveness of mitigation strategies and alter ineffective strategies
- Identifying and carrying out continuous monitoring steps
- Periodically reporting status, trend analysis, and success of mitigation efforts of assigned risks to the IFM Program Director and external entities

An additional part of risk ownership includes estimating and allocating risk reserves for Program and Project risks. A comprehensive methodology has been developed to facilitate this process. Appendix B provides detailed information about the risk reserve allocation process.

6.4 RISK TRACKING AND CONTROL

Risk Tracking, performed primarily by the Risk Manager and Risk Owner, requires active monitoring and status updates for identified risks. Tracking includes monitoring the risk posture and mitigation activities. Should the mitigation strategies prove ineffective in reducing risk criticality, the Risk Manager and Risk Owner will identify additional or alternate mitigation strategies. The Risk Manager will also analyze the top Project risks and mitigation strategies provided in MSR briefings for the following purposes:

- Determining the relevance of risks identified for one project to another
- Sharing successful mitigation strategies
- Identifying Project risks that may have impacts or implications at the Program level
- Confirming that appropriate risks and mitigations/contingencies have been identified.

The Risk Manager will use a Risk Database (e.g., Excel spreadsheet) to effectively and continuously track and manage the Program's risks. While the Erasmus Management Reporting tool serves as the official risk record for the IFM Program, the Program will use a risk management database to track and manage Program-level risks on a daily basis.

6.5 IFM KNOWLEDGE SHARING SYSTEM

The IFM Program and each Project should consult the IFM Knowledge Sharing System (KSS) prior to major milestones and apply significant lessons learned. KSS enables the knowledge gained from past experience to be applied to current and future projects to avoid the repetition of past failures and mishaps. The KSS Plan identifies the process for submitting IFMP Lessons Learned to the system.

6.6 RISK DATABASE

The IFM Program risk management database serves as the official risk record for the IFM Program. The database assists the Risk Manager and Risk Owners in continuously monitoring their assigned risks. The database risk record captures specific information such as the risk owner, responsible team, timeline, risk statement, mitigation statement, overall severity rating, and the mitigation action steps taken in a given time period. Additionally, documentation will be attached (within the database) to each risk to record more detailed information related to risk planning, tracking and control activities. The Program also records its top 10 risk in the Agency's Management Reporting tool, ERASMUS. It is the responsibility of the Risk Manager to ensure that ERASMUS information is maintained and updated in a timely fashion for Program Director approval.

7 COMMUNICATIONS AND REPORTING

The IFM Program Office has established a risk communications and reporting process based on the process recommended by the IFM Program Risk Management Framework. The IFM Program Communications Process is illustrated in Figure 7-1.

Figure 7-1. IFM Program Risk Communication Process

Information Sources	Information Provided	Information Recipients	Frequency of Exchange
Independent Reviews/Assessments	• Identified risks • Informed advice	• IFM Program Office • IPO • Module Projects • eGov Initiatives	As identified
Risk Identification Tools (FTA, FMCEA, Lessons Learned, etc.)	Potential risks	• IFM Program Office • IPO • Module Projects • eGov Initiatives • Receiving Centers	As identified
• IFM Program Office • IPO • Module Projects • eGov Initiatives • Receiving Centers	Risk Status	• PMC • IAR • NAR • Management	Periodic Meetings (according to existing schedules)
IFM Program Office	• Agreements • Guidance • Decisions	• IPO • Module Projects • eGov Initiatives • Receiving Centers	As required
• IPO • Module Projects • eGov Initiatives • Receiving Centers	Top 5 Project Risks and Mitigation Strategies	IFM Program Office	Monthly (via MSRs)

Independent reviews and assessments provide an objective, external source of potential Program risks and recommended mitigation strategies. The IPO, Module Projects, and eGov Initiatives will receive guidance on the Program level risks, as well as have the opportunity to identify potential Program level risks.

The IFM Program Director has responsibility for ensuring that all approved Module Projects and eGov Initiatives have appropriately accounted for Program level risk mitigation strategies in their Project Management Plans. All Project Managers will develop and maintain a Risk Management Plan addressing the top risks impacting their Project.

8 RISK MANAGEMENT PROCESS FACILITATION

A successful risk management process requires the support of Program Management. This Risk Management Plan represents IFMP's commitment to the continuous identification, analysis, planning, tracking, and control of Program risks. Additionally, the IFM Program Director reports Program risk status and mitigation as part of the periodic status reporting process to internal and external stakeholders. Mitigation activities will be incorporated into the IFM Program Schedule. These established process steps exemplify Program Management commitment to continuous risk management.

The IFM Program Director will appoint a Risk Manager to facilitate the Risk Management Process. The Risk Manager may be a NASA employee or a contractor, one person or a team. The Risk Manager position is not an official entity within the Program organization. Rather it is a part time role that could be assumed by any member of the Program Team or contractor support staff. The primary objectives of the Risk Manager are to get the process moving and keep it flowing.

Risk Management is an important aspect of Program and Project management, but it is tangential to the primary focus of each. As such, it benefits from a Risk Management facilitator that develops risk procedures (detailing process steps, participants, meeting schedules, documentation formats, and evidence of performance) and acts as a catalyst for the process. The Risk Management Process, in Figure 8.1, is the template for process performance and can be updated periodically as part of process improvement.

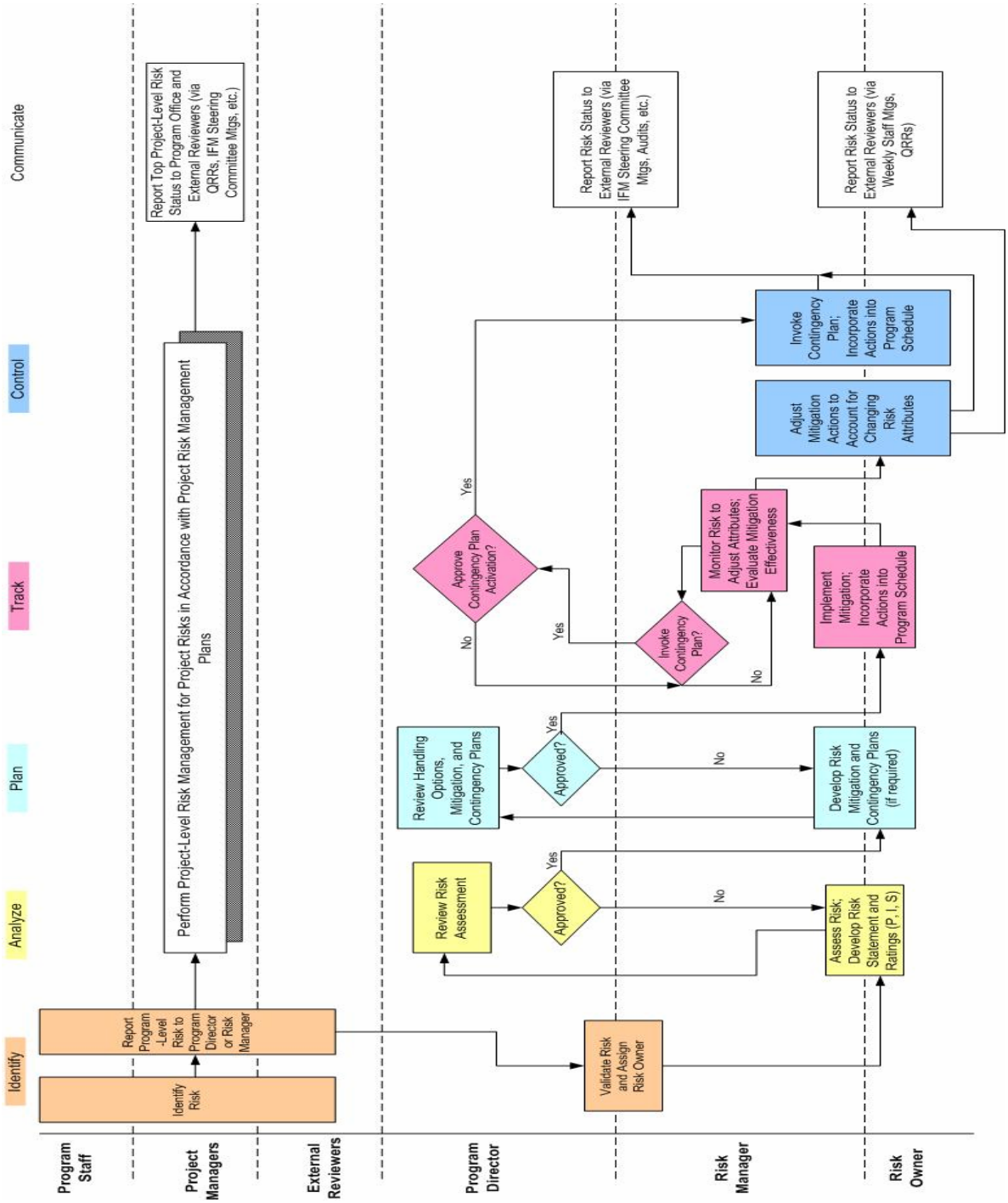
The Risk Management Process highlights decision points and facilitation activities. Activities include identifying and proposing new risks, developing risk statements, handling responses and mitigation options, calculating risk severity, and assigning risks. The Risk Management Process incorporates the implementation of mitigation options, risk monitoring, reviews and assessment, and risk reporting. The process supports the risk management approach of providing continuous assessment of what could go wrong and implementing appropriate mitigation activities, and contingencies should a risk occur, as well as the assignment of risks to owners who will be responsible for their effective mitigation.

To further assess the effectiveness of the Program's Risk Management Plan, the Risk Manager will track several risk statistics (or metrics) and report them quarterly to the Program Director. These metrics include the following:

- Number of risks identified over time
- Number of risks with active mitigation strategies
- Number of risks closed
- Changes in criticality level for each of the top Program risks
- Identification of risks that have materialized and become issues
- Identification of risks that have been mitigated.

Based on periodic assessment of these metrics, the Risk Management Plan or individual risk mitigation strategies may be revised.

Figure 3-2. IFM Program Risk Management Process



Note: Activities that cross dotted lines indicate shared responsibilities.

9 DESCOPE APPROACH

The IFM Program may require descoping based on the need to reduce or control cost, complexity, or schedule. Each trigger should be assessed independently to determine the descope objective and the resulting strategy. In the event that the IFM Program should require descoping, the strategy to be employed would vary depending upon which phase of the Program life cycle was in process at the time. The Risk Manager and Program Director would evaluate the effect of the descope strategy on existing risks and identify any resulting new risks. A with other identified risk, a risk analysis will be performed and mitigation and contingency plans developed, if required. The IFM Program will execute the descope strategy when any of the identified triggers occur at the Program, Project, or externally.

10 REFERENCES

NASA Procedures and Guidelines (NPG) 7120.5B, NASA Program and Project Management Processes and Requirements, November 21, 2002

NASA Procedures and Guidelines (NPG) 8000.4, *NASA Risk Management Procedures and Guidelines*, April 25, 2002

NASA Integrated Financial Management Program (IFMP) Program Management Plan, February 7, 2002

IFM Program Risk Management Framework, Version 1, November 7, 2000

IFMP Benchmarking Resource Library Framework, Version 1, September 15, 2000

Continuous Risk Management Guidebook, Software Engineering Institute at Carnegie Mellon University, 1996

California Health and Human Services Website, http://www.bestpractices.cahwnet.gov/Support%20Processes/Risk%20Mgmt/risk%20mgmt%20-%20planning.htm

Risk Management: Guidelines and Best Practices, Missouri Information Technology Advisory Board, Project Management Committee, Risk Management Subcommittee, November 2003

APPENDIX A – RISK CONTINGENCY RESERVE ALLOCATION

As part of the annual budgetary process, reserves are to be calculated for the Program Office, the Integration Project Office, and each of the Module Project Offices. The reserves are risk-based; every dollar of reserves should be tied directly to the cost of occurrence of a specific risk.

General Concept. The procedure to calculate reserves and incorporate them into the budget is a three-tiered process. The first part consists of the respective office identifying risks and allocating a reserve dollar amount to each one of the risks. A likelihood of occurrence and a level of consequence are also identified, which together determine the criticality of the risk based on the risk matrix in Section 5. The second step of the process is for the Program Office to collect all of the information from the various offices and to use the provided information to create frequency distributions around each of the risks. Based upon the likelihood of occurrence of each risk, confidence levels are assigned, which provide a rigorous reserve amount. In the third step the Program Office reviews the assigned reserves with each of the owners and makes any final adjustments before incorporating them into the budget. In the case that the scope or the schedule changes to the pertinent projects, this procedure must be repeated to ensure that the reserves allocation accurately reflects up-to-date risks.

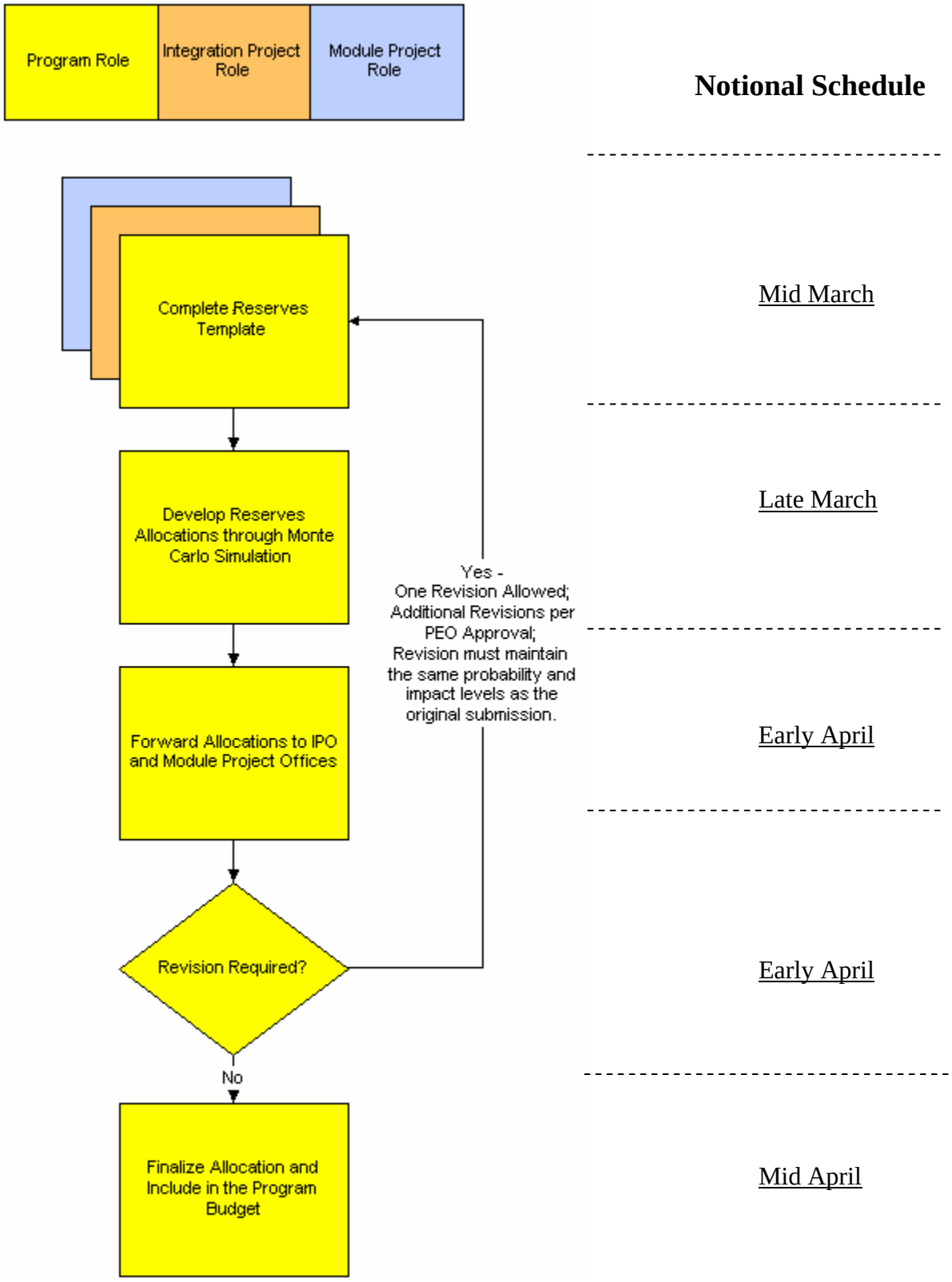
Roles and Responsibilities. The roles and responsibilities for each office are summarized in Table A-1.

Table A-1. Roles and Responsibilities for Contingency Reserves Allocation Process

Roles	Responsibilities
Program Office	▪ Prepare a reserves template ▪ Use Crystal Ball® to develop Monte Carlo frequency and cumulative distributions for each risk of every submission ▪ Send analysis of reserves to respective offices for their review and revision ▪ Review adjusted reserves allocations and approve
Integration Project Office, Module Project Offices	▪ Complete Program-provided reserves template ▪ Review reserves allocations and revise, if necessary

Reserves Process. The flowchart in Figure A-1 illustrates the process as well as a notional timeline of when the respective activities should be accomplished.

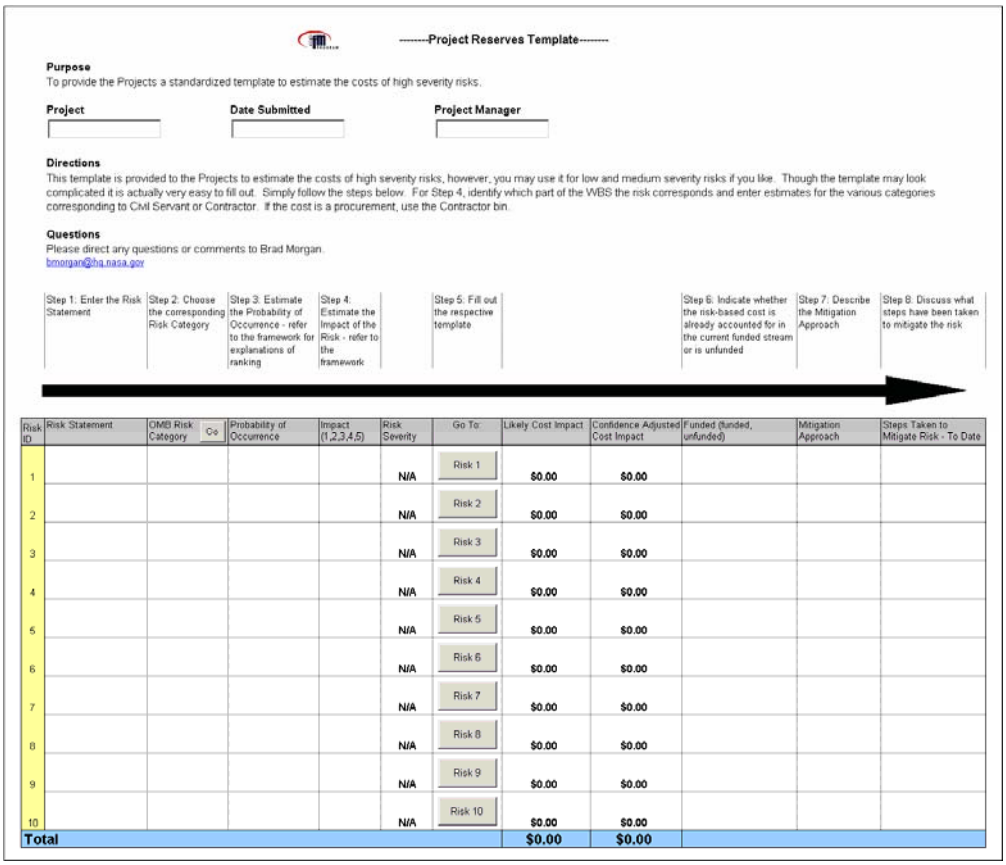
Figure A-1. Contingency Reserves Allocation Process



To complete the reserves template follow the eight steps below, which are also summarized in the Project Reserves Template in Figure A-2.

1. Identify all relevant risks and provide a detailed risk statement.
2. Identify the relevant Office of Management and Budget (OMB) Risk Categories.
3. Using the Risk Analysis process outlined in Section 5, select a Likelihood of Occurrence ranking (1-5). Assign a confidence level according to your selection. (See below for further explanation.)
4. Using the Risk Analysis process outlined in Section 5, select a Consequence ranking (1-5).
5. Using the 'Project Reserves Template,' input level of effort (LOE), full-time equivalents (FTE), travel requirements, and software and hardware assumptions that reflect the costs of contingency for the risk, whereby:
    a. Min, Likely, and Max assumptions are required for all assumptions
    b. The assumptions are organized by WBS.
6. Identify whether the reserve is already included in the reserves budget or is not currently funded.
7. Describe the contingency approach – this should reflect the cost assumptions that were made.
8. Describe contingency and/or mitigation steps taken to date for the risk.

Figure A-2. Project Reserves Template



--------Project Reserves Template--------

Purpose
To provide the Projects a standardized template to estimate the costs of high severity risks.

Project | **Date Submitted** | **Project Manager**

Directions
This template is provided to the Projects to estimate the costs of high severity risks, however, you may use it for low and medium severity risks if you like. Though the template may look complicated it is actually very easy to fill out. Simply follow the steps below. For Step 4, identify which part of the WBS the risk corresponds and enter estimates for the various categories corresponding to CMI Servant or Contractor. If the cost is a procurement, use the Contractor bin.

Questions
Please direct any questions or comments to Brad Morgan.
bmorgan@hq.nasa.gov

Step 1: Enter the Risk Statement | Step 2: Choose the corresponding Risk Category | Step 3: Estimate the Probability of Occurrence - refer to the framework for explanations of ranking | Step 4: Estimate the Impact of the Risk - refer to the framework | Step 5: Fill out the respective template | Step 6: Indicate whether the risk-based cost is already accounted for in the current funded stream or is unfunded | Step 7: Describe the Mitigation Approach | Step 8: Discuss what steps have been taken to mitigate the risk

Risk ID	Risk Statement	OMB Risk Category	Go	Probability of Occurrence	Impact (1,2,3,4,5)	Risk Severity	Go To:	Likely Cost Impact	Confidence Adjusted Cost Impact	Funded (funded, unfunded)	Mitigation Approach	Steps Taken to Mitigate Risk - To Date
1						N/A	Risk 1	$0.00	$0.00			
2						N/A	Risk 2	$0.00	$0.00			
3						N/A	Risk 3	$0.00	$0.00			
4						N/A	Risk 4	$0.00	$0.00			
5						N/A	Risk 5	$0.00	$0.00			
6						N/A	Risk 6	$0.00	$0.00			
7						N/A	Risk 7	$0.00	$0.00			
8						N/A	Risk 8	$0.00	$0.00			
9						N/A	Risk 9	$0.00	$0.00			
10						N/A	Risk 10	$0.00	$0.00			
Total								**$0.00**	**$0.00**			

Contingency Determination and Reserve Allocation. Upon receipt of the completed template, the Program Office will run Monte Carlo simulations to establish a frequency distribution of the cost impacts. Based on the risk likelihood, each risk will be evaluated at a certain confidence level establishing the associated reserve allocation. Confidence levels will be evaluated according to information provided in the template by the Projects. For example, the template requests that the Project provide a likelihood of occurrence based on the following available rankings and associated confidence levels:

Likelihood of Occurrence Ranking	Confidence Level Range
1 Very Low	1% - 20%
2 Low	21% - 40%
3 Moderate	41% - 60%
4 High	61% - 80%
5 Very High	81% - 100%

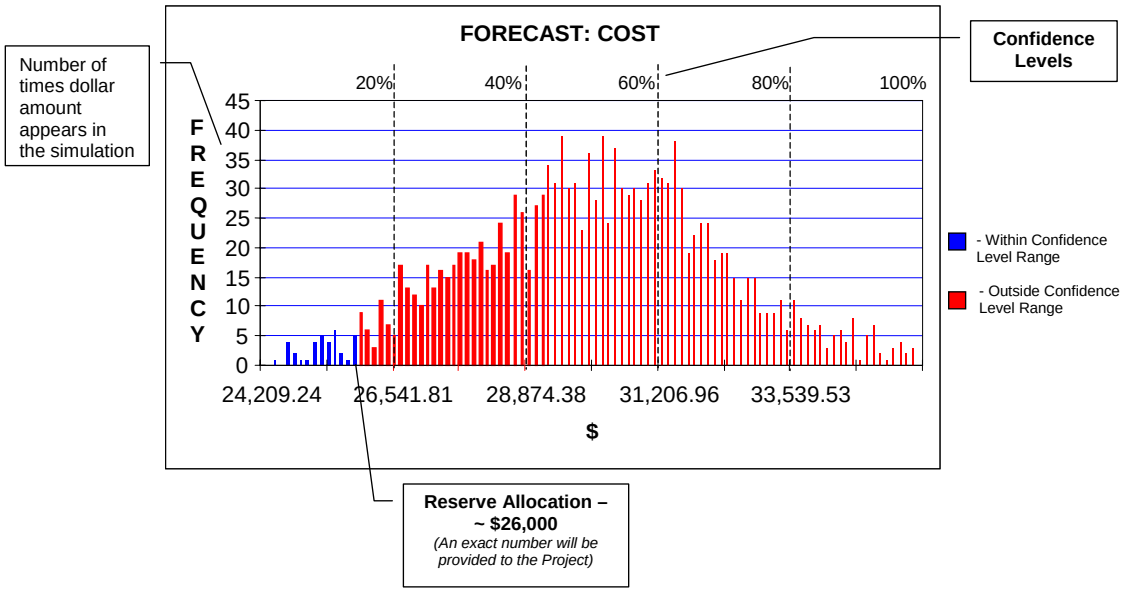
The user is thus asked to choose a Likelihood Rating and approximate a percentage of confidence that the risk will occur. If a Project selects a Likelihood Rating of Very Low and, based on evidence asserts that there is little chance that the risk will actually occur, it can assign a confidence level of 5%. Likewise, if the Project feels that the Likelihood is higher, they can assign a confidence level of 20%. This enables the Program to assign a quantifiable measurement to each Likelihood Rating based on risk knowledge from the Program. If this information is not provided, confidence levels could be assigned too conservatively or to liberally. The Program then runs the risk of allocating too little funding or excessive funding.

If a Project is unsure of the confidence level or does not provide this information in the template, the Program Budget staff will work with the Program Risk Manager to quantify risk likelihood, if possible, or default to the mid-percentage for each Confidence Level Range (i.e., 10% for Very Low, 30% for Low, 50% for Moderate, etc.).

The Program executes the Monte Carlo simulations for each risk. Resulting reserve allocations for each risk are summed to yield the total risk reserve allocation the Project. The Confidence Level outputs and resulting contingency reserve allocations will be sent to each respective Project Office for review (in accordance with the process outlined in Figure B-1. An example of the Confidence Level output for a Very Low Likelihood Rating (Rating = 1) and Confidence Level of 20% is shown in Figure A-3.

Figure A-3. Example – Very Low Confidence Level

Very Low Likelihood of Occurrence
Confidence Level Range – 1%-20%



LIST OF ACRONYMS

CRMM	Continuous Risk Management Model
COTS	Commercial Off-the-Shelf
eGov	Electronic Government
EOY	End of Year
FMCEA	Failure Mode, Cause, and Effect Analysis
FTA	Fault Tree Analysis
FTE	Full-time Equivalent
GSFC	Goddard Space Flight Center
IAM	Integrated Asset Manager
IAR	Independent Annual Review
IFM	Integrated Financial Management
IFMP	Integrated Financial Management Program
IPO	Integration Project Office
IT	Information Technology
IV&V	Independent Verification and Validation
LLIS	Lessons Learned Information System
LOE	Level of Effort
MSFC	Marshall Space Flight Center
MSR	Monthly Status Review
NAR	Non-Advocate Review
NASA	National Aeronautics and Space Administration
NPG	NASA Procedures and Guidelines
NPR	NASA Procedural Requirements
OMB	Office of Management and Budget
PEO	Program Executive Officer
PMC	Program Management Council
QRR	Quarterly Risk Review
SATC	Software Assurance Technology Center
SEI	Software Engineering Institute
WBS	Work Breakdown Structure